REMARKS

The Office Action dated December 3, 2002 has been read and carefully considered and the present amendment submitted to point out the differences between the Applicant's invention as defined in the claim language and the disclosures of the cited references.

In the aforesaid Office Action, the drawings were objected to under 37 CFR 1.83(a) as not showing every feature of the claimed invention and, accordingly, a set of corrected drawings is submitted with the present amendment. In the corrected drawings, the legend "Prior Art" has been added to Fig. 1. In Figure 2, a spring has been added and, to avoid the possible introduction of "new matter" the spring has been drawn as described in the original specification on page 7, lines 24-27 as "an additional spring (or springs), one of it extremes connected with a movable link, the other extreme connected with the other link and its intermediate point connected with the working element".

In addition, two reference numerals have been added to Figure 2 to show the self blocking feature and those numerals have been assigned to the spring (12) mentioned in original claim 5 and (13) the self-blocking kinematic connection between at least one of the motors 3 and its corresponding movable link 6 (as mentioned in original claim 9 and in original page 8, lines 14-22. Thus the changes to the drawings are submitted to have not introduced "new matter" into the present application.

An objection was also made to the form of the Abstract and a new abstract is provided herein that is only one paragraph. In addition, the specification has been amended to include in the "Background of the Invention" section, the additional art cited by the Examiner and the additional numbers now appearing in the drawings (12) and (13) have been added to the "Brief Description of the Drawings " and to the specification where the appropriate elements have been referenced.

Claims 2-11 were rejected under 35 U.S.C. 112, second paragraph, and, therefore, claims 1-11 have been cancelled, without prejudice, and new claims 12- 17 entered in order to clarify the language that the Examiner considered to be indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically the terms "extreme" and "other extreme" have been replaced by the more definite "first extreme" and "second extreme" , respectively, and the use of "the" has been avoided where there is no clear antecedent to justify the use of that reference. In addition, the word "them" has been replaced with "said working elements", for example in new claim 15 (prior claim 10). Other changes include the preamble of the claims to "Device for a working element with two degrees of mobility" to be in accord with the intent and title of the specification. Finally, certain clerical errors have been corrected in the newly submitted claims 12-17 that were found in the prior claims 1-11.

Claim 1-4 and 6-9 were rejected under 35 U.S.C. 102(b) as being anticipated by Vainstock, U.S. Patent 4,962,676. Claim 5 was rejected under 35 U.S.C. 103(a) as being unpatentable over Vainstock in view of Nunes *et al*, U.S. Patent 5,964,124 and claims 10 and 11 rejected under 35 U.S.C. 103(a) as being unpatentable over Vainstock.

With the newly submitted claims 12-17, therefore, the present claims 12-17, basically are such that new claim 12 has been derived by a combination of original claims 2, 4 and 5; claim 13 corresponds to original claim 8; claim 14 corresponds to original claim 9; claim 15 corresponds to original claim 10; claim 16 is a new claim based on the specification, page 9, lines 12-13 and page 8, line 27 to page 9, line 4; and finally, claim 17 corresponds to original claim 11.

Thus, as now presented, claim 12 includes the prior language of claims 2, 4 and 5 and is submitted to be patentable over the Vainstock reference taken in view of Nunes *et al.* The technical solution disclosed in the present specification is simply <u>not</u> a combination of the prior art technical solutions disclosed in Vainstock and Nunes *et al.*

The distinction basically is that (1) the presence of springs allows the maintaining of the position of the working element parallel to the base during the movement of the actuator

if there are no external forces (movement of the robot's leg in the air). Also, (2) when the actuator is working during the movement of the robot's body, (the legs rest on the floor) the springs permit the turning of the working element with respect to the robot's body by means of the friction force and return the working element to the initial position in the movement of raising the robot's leg.

Therefore, it can be seen that the present technical solution cannot be considered a combination of the Vainstock and Nunes *et al* disclosures and the solution provided by the Applicants is significantly different as can be appreciate by the Figures in the specification.

Thus, it is submitted that claim 12 is patentable over the references of record. Taking further, claims 15 and 16 it should be pointed out that the present using actuators in the same base provided with movable links with different lengths is not trivial because of the following reasons;

1. On the one hand, the solution has not been used before in walking machines.

2. On the other hand, this present solution permits achieving an increment of the working zone of each of the robot's legs, which permits the increase of the speed of the robot; and

3. Most importantly, the present solution permits the increase of the stability of the movement in a required direction, which is an absolutely novel feature, and the basis of the claim of novelty can be found in the article "The Influence of Gravity on Trajectory Planning of Climbing Robots with Non-Rigid Legs": (Journal of Intelligent and Robotic Systems 35: 309-326. 2002, Kluwer Academic Publishers), copy enclosed. This effect is described at pages 322-324 of the article (legs with shorter movable links are more rigid, and legs with longer movable links are less rigid, the use in the same robot permits an increase in the stability of the movement in a required direction).

The connection between the base and the first ends of the movable links has been performed in a way that permits movement in coincident trajectories on the same straight

line; this technical solution (also enabling a reduction in the size of the robot) is not disclosed in either Vainstock or Nunes *et al* references.

According with the foregoing submission, it is apparent that the devices disclosed in the cited references differ from the structure and design of the present application and lack the advantages achieved and realized by the Applicants.

Accordingly, it is submitted that the newly submitted claims 12-17 are patentable over the cited references and the allowance of the present application is respectfully solicited.

Respectfully submitted,

DAVID A. JACKSON
Attorney for Applicant(s)
Registration No. 26,742

KLAUBER & JACKSON
411 Hackensack Avenue
Hackensack, NJ 07601
(201) 487-5800

VERSION WITH MARKING TO SHOW CHANGES MADE

IN THE SPECIFICATION

The Abstract on page 1 has been amended as follows

ABSTRACT

DEVICE OF A WORKING ELEMENT WITH TWO DEGREES OF MOBILITY

A working element with two degrees of mobility, which, with the assistance of two motors manages to move two movable links, one of them acting on the working element, this is a method which is distinguished in the simultaneous action on a working element with the assistance of another movable link. [

]

The guidance of a working element with two degrees of mobility which has two motors one of which is housed in the base and connected kinematically with an extreme of the first movable link located in the base with possibility of movement and the other motor connected kinematically with an extreme of the second movable link, and the working element which is connected with the other extreme of the second movable link.

The Section entitled BACKGROUND OF THE INVENTION beginning on page 2, line 8 and ending on page 3 line 27 has been amended as follows:

BACKGROUND OF THE INVENTION

In known technical solutions [1-5], the following is habitually employed.

The handler which is known, with two degrees of mobility, (figure 1) has two motors (2,3) one of which (2) is housed in the base and is kinematically connected with an extreme of the first movable link (5) housed in the base (1), with possibility of movement, and the other motor (3) is kinematically connected with an extreme of the second movable link (9) and the working element (4), which is connected with the other extreme (10) of the second movable link (6).

In this technical solution, the second motor (3) is fastened to the other extreme of the first movable link (5).

The drawbacks of this construction concern the fact that the second motor is mobile (during the movement of the first movable link this motor is in motion) which increases the mass of the parts in movement. This also reduces the speed and has an unnecessary energy consumption. In addition, the device known has an open kinematic train which leads to deficiencies in the stiffness of the construction and as a result thereof the need to augment the mass to improve this stiffness.

1. Industrial robot.

Patent number: EP 0320498

Publication date: 1989-06-14

Inventor(s): WINTER ALFRED ING; SCHENDL ADOLF DIPL-ING

EC Classification: B25J9/02B2 ; B25J18/02 ; B25J19/00D2 ; B23Q1/40 ; B23Q1/62A5 ; B23Q1/00B2 ; B23Q11/00C

2. High cadence industrial robot for moving a tool along three orthogonal Cartesian axes.

Patent number: EP0546592

Publication date: 1993-06-16

Inventor(s): VIVIER YVES CHARLES BERNARD (FR); FAYEL

EC Classification: B25J9/00H1 ; B25J9/02B

3. Robot for guiding movements and control method.

Patent number: EP0574330 A1 931215

Publication date: 1995-03-21

Inventor(s): LAVALLEE STEPHANE (FR); TROCCAZ JOCELYNE (FR)

EC Classification: G05B19/423

4. Climbing robot movable along a trestle structure, particularly of a pole for high-voltage overhead electric lines.

Patent number: EP 0401751

Publication date: 1990-12-12

Inventor(s): PARIS LUIGI (IT)

EC Classification: B62D57/024

5. Method for controlling the movements of an industrial robot at and near singularities.

Patent number: EP 0672507

Publication date: 1995-09-20

Inventor(s): SNELL JOHN-ERIC (SE)

EC Classification: B25J9/16L6

6. Patent Number: US 4,962,676 (1990)

Patent Number: US 5,964,124 (1999)

Patent Number: US 6,328,510 (2001)

Patent Number: US 5,886,494 (1999)

Patent Number: US 5,421,695 (1995)

Patent Number: US 5,248,923 (1993)

Patent Number: US 4,618,309 (1986)

Patent Number: US 4,256,947 (1981)

Patent Number: US RE37,731 E (2002)

The Section entitled BRIEF DESCRIPTION OF THE INVENTION beginning on line 29 of page 3 and ending at line 13 of page 4 has been amended as follows:

[BRIEF] DESCRIPTION OF THE INVENTION

The method of displacement of a working element with two degrees of mobility, which, with the assistance of two motors manages to move two movable links, one of them acting on the working element, this is a method which is distinguished in the simultaneous action on a working element with the assistance of another movable link.

The [guidance] device of a working element with two degrees of mobility [which] as claimed, has two motors one of which is housed in the base and connected is kinematically with an extreme of the first link located in the base with possibility of movement and another motor connected kinematically with an extreme of the second movable link, and the working element which is connected with the other extreme of the second movable link, this guidance is that which is distinguished in the fact that the second motor is housed in the base and an extreme of the second movable link connected with this motor is stiffened in the base with possibility of movement and the other extreme of the first movable link is connected with the working element.

The Section entitled BRIEF DESCRIPTION OF THE DRAWINGS beginning at line 15 of page 6 and ending at line 6 of page 7 has been amended as follows:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1. The known guidance of movement of the link with two degrees of mobility.

Figure 2. The proposed guidance of movement of the link with two degrees of mobility.

Figure 3. Example of embodiment of the proposed guidance – the walking robot, in which four proposed guidance arrangements are being employed (viewed from above).

Figure 4. Example of embodiment of the proposed guidance – the walking robot, in which four proposed guidance arrangements are being employed (viewed from the side).

List of the numbering references of the elements shown in the Figures.

14. The base of the guidance arrangement
15. The first motor
16. The second motor
17. The working element
18. The first movable link
19. The second movable link
20. The first extreme of the first movable link
21. The second extreme of the first movable link
22. The first extreme of the second movable link
23. The second extreme of the second movable link
24. The foot of the robot with the guidance for vertical movement (this guidance is not shown in the drawing).
25. Spring
26. Self-blocking kinematic connection between at least one of the motors 3 and its corresponding movable link 6

The paragraph beginning at line 22 on page 7 and ending at line 1 of page 8 has been amended as follows:

In the device proposed, when there exists an articulated union between the working element and both movable links, there could be an additional spring (or springs) (12), one of its extremes connected with a movable link, the other extreme connected with the other link and

its intermediate point connected with the working element. In such a case, if there are no external forces acting on the working element, the latter shall maintain its angular position with respect to the base. If external forces act on the working element, the latter can change its angular position relative to the base, but when these forces cease to act, the working element shall recuperate its angular position with respect to the base. This is important, especially when the operation is utilised for the horizontal actuation of the leg of a walking robot.

In the device proposed, the lengths of the movable links can be different, however it is preferable they be identical (in this case it is easier to move the working element over the required trajectory).

The paragraph on page 8 beginning at line 14 and ending at line 22 has been amended as follows:

In the device proposed it is desirable (but not mandatory) to make a kinematic connection between at least one of the motors and the corresponding movable link with a self-blocking transmission (13) (for example with the aid of a nut and spindle assembly). In that case it is possible to disconnect the motors when the device is stopped and the working element can maintain its position due to the self-blocking effect. This shall permit a reduction in energy consumption.